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To: Commissioner for Patents From: Steven L. Nichols  
Fax: (571) 273-8300 Pages: 13 pages including coversheet  
Phone: Date: August 18, 2006  
Re: Application No. - 09/821,648

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4. Reply Brief (9 pages)

AUG 18 2006

Serial No.: 09/821,648

40169-0031

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application: Zheng J. Geng

Application No.: 09/821,648

Filed: March 29, 2001

Title: "Method and Apparatus for  
Omnidirectional Imaging"

Examiner: REKSTAD, Erick J.

Group Art Unit: 2621

Conf. No.: 5727

Mall Stop Appeal Brief-Patents  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

TRANSMITTAL OF REPLY BRIEF

Sir:

Transmitted herewith is the Reply Brief with respect to the Examiner's Answer mailed on June 22, 2006.

This Reply Brief is being filed pursuant to 37 CFR 1.193(b) within two months of the date of the Examiner's Answer.

(Note: Extensions of time are not allowed under 37 CFR 1.136(a))

(Note: Failure to file a Reply Brief will result in dismissal of the Appeal as to the claims made subject to an expressly stated new ground rejection.)

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Rebecca R. Schow

Respectfully submitted,

By: 

Steven L. Nichols (Reg. No.: 40,326)  
Attorney/Agent for Applicant(s)  
Telephone No.: (801) 572-8066  
Date: August 18, 2006

40169-0031

DUPLICATE

Serial No.: 09/821,648

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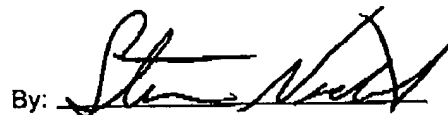
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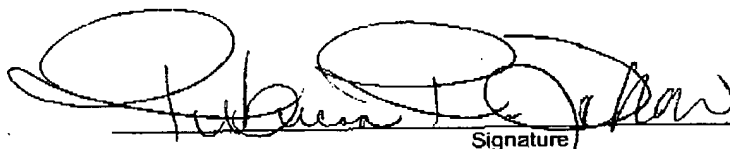
Application No.: 09/821,648

Attorney Docket No.: 40169-0031

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09/821,648

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In the Patent Application of

Zheng J. Geng

Application No. 09/821,648

Filed: March 29, 2001

For: Method and Apparatus for  
Omnidirectional Imaging

Group Art Unit: 2621

Examiner: REKSTAD, Erick J.

REPLY BRIEF

Mail Stop Appeal Brief - Patents  
Commissioner for Patents  
P.O. Box 1450  
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Sir:

This is a Reply Brief under Rule 41.41 (37 C.F.R.) in response to the Examiner's Answer of June 22, 2006 (the "Examiner's Answer").

40169-0031

09/821,648

**Claim 1:**

Claims 1-6 were rejected as unpatentable under 35 U.S.C. § 103(a) in view of the combined teachings of U.S. Patent No. 6,118,474 to Nayar ("Nayar") and U.S. Patent No. 5,870,135 to Glatt et al. ("Glatt").

Claim 1 recites:

A method for generating a selectable perspective view of a portion of a hemispherical image scene, comprising the steps of:  
acquiring an omnidirectional image on an image plane using a reflective mirror that satisfies a single viewpoint constraint and an image sensor;  
defining a perspective viewing window based on configuration parameters; and  
mapping each pixel in the perspective window with a corresponding pixel value in the omnidirectional image on the image plane using a look-up table based on the configuration parameters.

In contrast, the combination of Nayar and Glatt fails to teach or suggest this subject matter and, perhaps more importantly, fails to enable one of skill in the art to practice the method of claim 1.

Appellant has previously pointed out that Nayar teaches the collection of a wide-angle image but fails to teach or suggest the claimed mapping of pixels "using a look-up table." Consequently, the Office Action cites Glatt as teaching "mapping from a fish-eye lens (which is hemispherical) to cartesian coordinates using a look-up table." (Action of 9/21/05, p. 2).

Appellant has pointed out, however, that Glatt does not teach or suggest how mapping could or would be performed using a look-up table for an image that comes, not from a fish-eye lens, but from a reflective mirror as claimed. In response to this point, the Examiner's Answer argues that "[i]t is not the intension [sic] of the Examiner to suggest that the look-up table of Glatt can be imported into the system of Nayar. It is the intension [sic] of the Examiner to use a look-up table (as taught by Glatt) with the system of Nayar in order to provide a means to

40169-0031

09/821,648

translate the hemispherical image into a normal camera image without continuously having to perform complex calculations.” (Examiner’s Answer, p. 21). *However, the prior art of record does not teach or enable one of skill in the art to do that.*

Appellant’s specification, beginning at paragraph 0035, discloses the equations and techniques needed to successfully map each pixel in a perspective viewing window with a corresponding value in an omni-directional image *using a look-up table*, where the omni-directional image is taken using a reflective mirror rather than a fish-eye lens. This information is *not* found in the prior art of record.

This is implicitly acknowledged by the Examiner’s Answer. However, the Examiner’s Answer assumes, without any support, that all the information in Appellant’s specification that enables claim 1 would be obvious to one of skill in the art. This is both unreasonable and legally insufficient to support a rejection of Appellant’s claim 1.

It is beyond credibility to suggest, with no support, that one of skill in the art could obviously and with insignificant effort reproduce the work of Appellant in, for example, paragraphs 0035-0042 of Appellant’s specification. If one of skill in the art somehow decided to do as the Examiner’s Answer supposes, i.e., “use a look-up table (as taught by Glatt) with the system of Nayar in order to provide a means to translate the hemispherical image into a normal camera image,” (Examiner’s Answer, p. 21), neither Nayar nor Glatt instruct that skilled artisan how to proceed. That skilled artisan must invent some method of creating the desired look-up table, as Appellant has done. This would clearly require significant work and experimentation.

Thus, it is improper for the Examiner’s Answer to suggest that one of skill in the art could practice the method of claim 1 from the teachings of Nayar and Glatt. “In order to render a

40169-0031

09/821,648

claimed apparatus or method obvious, the prior art must enable one skilled in the art to make and use the apparatus or method." *Beckman Instruments, Inc. v. LKB Produkter AB*, 892 F.2d 1547, 1551, 13 U.S.P.Q.2d 1301, 1304 (Fed. Cir. 1989); *In re Payne*, 606 F.2d 303, 314, 203 U.S.P.Q. 245, 255 (CCPA 1979). In the present case, one of skill in the art *cannot* take the teachings of Nayar and Glatt and, from them, practice the method of claim 1. Consequently, the combination of Nayar and Glatt must be insufficient to render unpatentable the method of claim 1. Therefore, the rejection of claim 1 and its dependent claims based on Nayar and Glatt should not be sustained.

Additionally, claim 1 does not merely recite using a look-up table to map pixels in a perspective window with corresponding pixel values in an omnidirectional image. Rather, claim 1 recites that the look-up table is based on "configuration parameters" that define the perspective window. These configuration parameters may include a particular zoom, pan angle or tilt angle. (See claim 2). In contrast, the combination of Nayar and Glatt does not teach or suggest a look-up table for mapping between a perspective viewing window and omnidirectional image where the look-up table *is based on configuration parameters that also define the desired perspective viewing window*.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)." M.P.E.P. § 2143.03. Accord. M.P.E.P. § 706.02(j). For at least this additional reasons, the rejection of claim 1 and its dependent claims should not be sustained.



40169-0031

09/821,648

**Claim 2, 3, 18, 19, 34 and 35:**

The various dependent claims in the application recite further subject matter that is not taught or suggested by the prior art of record. For example, claim 2 recites:

wherein the configuration parameters defined in the defining step include at least one of a zoom distance defined as the distance from the focal point of said reflective mirror to said window, a pan angle defined as the angle between the x axis and a line through the focal point of said reflective mirror perpendicular to the x-y plane and a tilt angle defined as the angle between the x-y plane and a vector normal to said window.

Claims 18 and 34 recite similar subject matter.

In contrast, Nayar and Glatt fail to teach or suggest the claimed configuration parameters including a zoom distance *defined as the distance from the focal point of a reflective mirror to a user-defined window*, a pan angle and tilt angle as claimed. The Examiner's Answer makes reference to portions of Nayar and Glatt which mention zoom, pan and tilt, but which do not teach or suggest zoom as defined in claim 2 and used as a configuration parameter for a perspective viewing window. For at least these additional reasons, the rejection of claims 2, 3, 18, 19, 34 and 35 should not be sustained.

**Claims 4, 5, 20 and 36:**

Claim 4 recites:

wherein the mapping step includes the step of generating a mapping matrix by:  
applying a ray tracing algorithm to each pixel in the perspective viewing window to determine a corresponding reflection point on the reflective mirror; and  
projecting each reflection point to a focal point of the image sensor to determine the corresponding location in the omnidirectional image on the image plane.

Claims 20 and 36 recite similar subject matter.

40169-0031

09/821,648

In contrast, Nayar and Glatt, as demonstrated above, teach mapping from a fish-eye lens. Consequently, Nayar and Glatt cannot and do not teach or suggest a method having a mapping step that includes “*generating a mapping matrix*” by applying a ray tracing algorithm to each pixel in the perspective viewing window to determine a corresponding reflection point on the reflective mirror as claimed.

In response, the Examiner’s Answer argues that “Nayar teaches the mapping steps as shown in Figures 4-6.” (Examiner’s Answer, p. 22) (citations omitted). However, this argument overlooks that claim 4 recites “*generating a mapping matrix by ...*.” In contrast, Nayar does not teach or suggest generating a mapping matrix. Moreover, the Examiner’s Answer fails to indicate how or where Nayar and Glatt teach or suggest generating a mapping matrix with respect to a reflective mirror as recited in claim 4.

For at least these additional reasons, the rejection of claims 4, 5, 30 and 36 based on Nayar and Glatt should not be sustained.

**Claims 14, 16-23, 31-38 and 44:**

Claims 14, 16-23, 31-38 and 44 were rejected as being unpatentable under 35 U.S.C. § 103(a) in view of the combined teachings of Nayar and U.S. Patent No. 4,908,874 to Gabriel (“Gabriel”). For at least the following reasons, this rejection is respectfully traversed.

Claim 14 recites:

An improved imaging apparatus for generating a two-dimensional image, comprising:  
a reflective mirror configured to satisfy an optical single viewpoint constraint for reflecting an image scene;

40169-0031

09/821,648

an image sensor responsive to said reflective mirror and that generates two dimensional image data signals to obtain an omnidirectional image on an image plane; and

a controller coupled to the image sensor, wherein the controller defines a perspective viewing window based on configuration parameters and maps pixels from said omnidirectional image into said perspective viewing window; and

*a memory for storing a mapping matrix for each of a plurality of sets of said configuration parameters in a parameter space, said controller using a said mapping matrix to perform mapping of pixels from said omnidirectional image into said perspective viewing window.*

(emphasis added).

The Examiner has conceded that “Nayar does not specifically teach the memory for storing a mapping matrix for each of a plurality of sets of said configuration parameters in [a] parameter space.” (Action of 9/21/05, p. 10). Consequently, the Examiner cites to Gabriel, which allegedly teaches “the use of matrices to perform transformations such as translation, contraction, expansion rotation and perspective projection.” (*Id.*). Appellant has noted, however, that Gabriel does not teach or suggest “a memory for storing a mapping matrix *for each of a plurality of sets of said configuration parameters in a parameter space*” as claimed.

In response, the Examiner’s Answer argues that this recitation “is very broad and is interpreted by the examiner to be a mapping matrix for each configuration parameter.” (Examiner’s Answer, p. 22). This is an unreasonable reading of the claim language.

Claim 14 recites a memory storing “a mapping matrix *for each of a plurality of sets of said configuration parameters.*” (Emphasis added). Thus, the claim calls for a number of mapping matrices that correspond, not to each of several different types of configuration parameters, but to each of a number of sets of specific configuration parameter values.

40169-0031

09/821,648

When read properly, it becomes clear that the prior art of record does not teach or suggest the claimed “a mapping matrix *for each of a plurality of sets of said configuration parameters.*” (Emphasis added). Moreover, the Examiner has failed to establish on the record how or where the cited prior art teaches or suggests this subject matter.

“To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).” M.P.E.P. § 2143.03. Accord. M.P.E.P. § 706.02(j). For at least these reasons, the rejection of claim 14 and its dependent claims and claims 31-38 and 44 should not be sustained.

**Claim 38:**

Claim 38 recites: “The imaging apparatus of claim 31, wherein said memory contains a predetermined mapping matrix for every set of configuration parameters in said parameter space.” In response, the Examiner’s Answer assumes that “every set contains one configuration parameter.” (Examiner’s Answer, p. 23). The Examiner’s Answer then argues that under such an interpretation, the combination of Nayar, Gabriel and Korein applies.

However, the Examiner has again indulged in an unreasonable interpretation of the claim language. Claim 38 recites “a predetermined mapping matrix for every set of configuration parameters in said parameter space.” (Emphasis added). That necessarily includes sets of configuration parameters that include multiple parameters. If such sets are not considered, that “every” set in the space is *not* accounted for contrary to the recitations of claim 38. Consequently, the Examiner cannot reasonable adopt the interpretation of the claim given in the Examiner’s Answer.

40169-0031

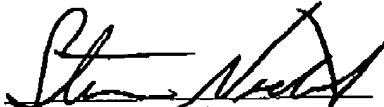
09/821,648

More importantly, if the claim is interpreted properly, as indicated above, it becomes clear that the cited prior art fails to teach or suggest the claimed memory containing a predetermined mapping matrix for every set of configuration parameters in a parameter space. For at least this additional reason, the rejection of claim 38 should not be sustained.

In view of the foregoing, it is submitted that the final rejection of the pending claims is improper and should not be sustained. Therefore, a reversal of the Final Rejection of September 21, 2005 is respectfully requested.

Respectfully submitted,

DATE: August 18, 2006

  
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Rebecca R. Schow